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from that mineral in its physical characteristics that I have taken the liberty to give it the name of 'Floridite.' It occurs as a rock that had long been mistaken as a limestone, but unlike a bedded limestone it is mostly in segregated masses, some of which will weigh a ton or more. On the Eagle Phosphate Company's property, of which I made a special examination, a shaft was commenced on an outcrop and sunk to the depth of $41\frac{1}{2}$ feet before it reached the bottom of the solid 'Floridite.' In a paper which I read at the Indianapolis meeting of the A. A. A. S. I gave it as my opinion that the Florida phosphate is a mineralization of an ancient guano. It differs entirely from the coprolite and gravel phosphates of the Carolinas, and the Peace River phosphate gravel or conglomerate phosphates that are found in the bed and shores of Peace River, in the southern part of Florida. The 'Floridite,' or rock phosphate, follows the trend of the Gulf of Mexico, and I have traced it from the southern part of Citrus county as far north as Madison in Madison county, and over a width of country fully twenty miles wide. I do not mean to say that it forms a continuous bed over this area, for there are many breaks where small patches only exist. The rock is found in many places cropping out, but is usually covered with from one to ten feet of sand. It is quarried by stripping off the covering of sand and breaking down the phosphate after the manner of quarrying stone.

"'Floridite' will average 80 per cent. of bone phosphate of lime. It is worth in the European market from \$25 to \$30 per ton, or, 33 to 38 cents per unit.

"I consider the discovery of this phosphate rock, which has heretofore been taken to be a limestone, as one of great importance to Florida and the entire Union, both on account of its commercial value and its stimulus to profitable agriculture."

MINERALOGY AND PETROGRAPHY.¹

Petrographical News.—The placing of the diabases among the intrusive rocks has for some time seemed a questionable proceeding to many petrographers. They so often occur as flows between sedimentary strata, and frequently apparently as surface flows, that it would appear more logical to place them among the effusives. Brauns² has lately described a diabase from Quotshausen in the valley of the Perf,

¹ Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

² *Zeits. d. Deutsch. Geol. Ges.* XLI., 1890, p. 491.

a tributary of the upper Lahn, which on its upper surface bears flowage marks like those in modern lavas. A section from this portion of the rock-mass shows a glassy base, dotted with grains of magnetite and mottled with irregularly shaped, doubly refracting areas, without further definite characteristics. Beneath the surface the mottlings resolve themselves into fibrous lath-shaped feldspar crystals, arranged in fluidal lines and extinguishing with a somewhat undulous extinction. The mass between these appears to be homogeneous, but in polarized light it is found to possess aggregate polarization. At a distance of twenty centimetres from its surface the rock consists of well-defined feldspar laths and little grains of augite and altered ilmenite. At 60-100 cm. from this surface it is a typical diabase. The interesting features connected with the occurrence are: 1, the undoubted former existence of the rock magma as a fluid upon the surface, as indicated by the structure of its upper portion and the flowage lines marked by the feldspar crystals; 2, the existence of the typical diabase texture (hypidiomorphic-granular) of the rock at but a little distance beneath its upper surface. The lack of crystals in its upper portion shows that crystallization began only after this part of the magma had come to rest. It was during this period of rest that all the crystallization took place; hence, the author concludes, rest and gradual cooling are the conditions necessary to the assumption of the hypidiomorphic structure. Continuing the subject further, the same writer describes an occurrence of diabase in a flow at Homertshausen, in Nassau. At some distance beneath its upper surface, where crystallization went on gradually, the rock is a normal diabase with an ophitic structure, and possessing no olivine. Nearer the surface it is rich in corroded olivine, poor in augite, and it contains radially divergent feldspar crystals cemented by glass. Nearer to the periphery it is composed of glass, holding crystals of augite and varioles of the composition and structure of diabase (concretions). On the periphery it is a glass with globulites, globosphærites, etc. The minute structure of each of these phases is described in great detail, as is also the effect of the solution of limestone inclusions upon the diabase material surrounding them. In the third³ division of his paper the author announces that Rosenbusch has decided to place the diabases with the effusive rocks, and then discusses their position in the scheme with respect to other basic effusives. He shows that there is no definiteness in the distinctions between augite-porphyrite, melaphyre, basalt, and diabase. Every definition that is proposed for any one of these rocks breaks down when exam-

³ *Ib.*, p. 523.

ined critically. He proposes a classification based upon slight differences in structure and appearance, ascribed primarily to differences in the conditions under which the rocks were formed, and consequently upon their geological age. They are divided as follows :

PALEOZOIC TO CARBON. MESOZOIC TO TERT. TERT. TO RECENT.

Granular	Diabase	Melaphyre	Basalt
Porphyritic	Diabase-porphyre	Melaphyre-porphyre	Basalt-porphyre
Glassy	Diabase-glass	Melaphyre-glass	Basalt-glass

It is also suggested that further definiteness might be obtained by prefixing the name of the characteristic phenocryst to the second portion of the name of the porphyrites, and to the first part the name of the characteristic mineral not porphyritically developed. Thus olivine-diabase-augite-porphyre is an olivine diabase containing porphyritic crystals of augite.—Of the two theories proposed for the explanation of the variolite of Durance, the one regards the rock containing the peculiar structure as related in some way to gabbro, the other looks upon it as an endomorphous contact product of diabase. Mr. Cole⁴ has examined the field relations of the rock, and has come to the conclusion that the variolite is a devitrification product of a spherulitic tachylite occurring occasionally on the sides of diabase dykes, but more frequently on the surfaces of lava flows. According to this view variolite stands in the same relation to the basic lavas as pyromeride does to those of acid character. The author compares the conditions yielding the variolites with those surrounding the Hawaiian lavas. Incidentally he mentions that gabbro is not as abundant a surface rock in the vicinity of Mt. Genève as has heretofore been supposed. The serpentines of the region he regards as having been derived from some more basic rock than this. The age of the diabases and the associated variolites is supposed to be Postcarboniferous.—Compound spherulites consisting of groups of small spherulites occur in a black obsidian at Hot Springs, in California. The compound body is marked by a divergent structure, which is due to a secondary crystallization set up in the rock after the small spherulites had accumulated at given points to form the compound body. The radiating substance is thought by Mr. Rutley⁵ to be orthoclase, crystals of which run uninterruptedly through the smaller spherulites. Mr. Rutley supposes the primitive spherulites to have been formed in the obsidian while it was still

⁴ *Quar. Jour. Geol. Soc.*, May, 1890, p. 295.

⁵ *Ib.*, Aug., 1890, p. 423.

liquid, and then to have floated around until they aggregated. After the formation of these accumulations they began to crystallize, and this produced the radiating structure. Mr. Iddings, who has also seen the specimens, regards the radiating structure as original and the spherulitic structure as secondary. The bodies, he thinks, are lithophysæ, and not spherulites.—The hornblende-bearing rocks of the Prussian Graftschaft Glantz have been divided into two groups,—the first comprising eruptive syenites, and the second including hornblende schists. Traube⁶ believes that the rocks of both groups are but facies of the same mass, but whether eruptive in origin or belonging to the crystalline schist series he is unable to decide. Both the so-called syenites and the hornblende schists consist of orthoclase, quartz, mica, and augite, together with hornblende derived from it. The amount of the hornblende present (all of which is secondary) and of the other constituents varies so widely that intermediate varieties between the two types are quite common. The rock in all cases is an augite-gneiss or a quartz-bearing augite-mica-syenite. From the nature of certain phenomena observed in limestone in contact with the hornblende rocks it is thought possible that these latter are eruptive.—In a very short communication Dr. Hobbs⁷ gives an account of the alteration of gabbro into hornblende-gneiss through gabbro-diorite at Ilchester, Md. The change from gabbro into gabbro-diorite is similar in its essentials to that described by Williams in the Baltimore area. The change into gneiss is effected through the granulation of feldspar, the fraying-out of hornblende, and the production of epidote and quartz.—Pilot Knob, a hill seven miles southwest of Austin, Texas, is regarded by Prof. Hill as a Cretaceous volcano. Its material, according to Mr. Kemp,⁸ consists of nepheline-basalt, with phenocrysts of olivine and augite in a ground-mass of microlites of augite and grains of magnetite in a nepheline-glass.

Mineralogical News.—*New Minerals.*—Rammelsberg⁹ has discovered associated with the eudialyte of Sigterö, near Brevig, in Norway, a new feldspar, which he calls *sigterite*. It has the cleavage of orthoclase. Its extinction against the edge $oP \wedge \infty P_{\infty}$ is 16° . On oP two sets of twinning lamellæ make with each other angles of 7° – 9° . The extinction of each individual is therefore $3\frac{1}{2}^{\circ}$ – $4\frac{1}{2}^{\circ}$. An analysis, corrected for impurities, gave: $SiO_2=50.27$; $Al_2O_3=$

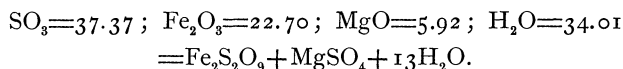
⁶ *Neues. Jahrb. f. Min., etc.*, 1890, I., p. 95.

⁷ *Trans. Wis. Acad. Sci., etc.*, VIII., p. 155.

⁸ *Amer. Geol.*, Nov., 1890, p. 292.

⁹ *Neues. Jahrb. f. Min., etc.*, 1890, II., p. 71.

30.75; $\text{Na}_2\text{O}=14.24$; $\text{K}_2\text{O}=4.73$. This corresponds to $(\text{NaK})_2\text{Al}_2\text{Si}_3\text{O}_{10}$, which according to the Rammelsberg view is $(\text{NaK})_2\text{Al}_2(\text{SiO}_3)_4 + (\text{NaK})_2\text{Al}_2(\text{SiO}_4)_2$. By doubling the formula it becomes a combination of albite and an alkaline anorthite, with nearly the composition of anhydrous natrolite. The new mineral is, consequently, a very basic alkaline feldspar, related to albite as follows: Albite $= \text{R}_2\text{Al}_2\text{Si}_6\text{O}_{16}$; sigterite $= \text{R}_2\text{Al}_2\text{Si}_3\text{O}_{10}$.—*Quetedita*, from the Salvador mine in Quetena, Chili, is a reddish-brown, translucent to opaque mineral, with a slightly waxy lustre. Its hardness is 3, and density 2.08–2.14. It occurs¹⁰ massive, associated with copper vitriol, and in prismatic monoclinic or triclinic crystals in the latter mineral. Its analysis gave:



—*Gordaita* accompanies sideronatrite from Sierra Gorda, near Caracoles, in Chili, as one of a number of thin coatings covering this mineral.¹⁰ It is glassy, transparent, and forms short, broadly-tabular pieces and crystals, or fibrous masses of a white to light gray color. Its hardness is 2.5–3, and specific gravity 2.61. The crystals are triclinic prisms with their lateral faces vertically striated. The mineral forms the end member of a series of hydrous iron-sodium sulphates, of which sideronatrite, with but a small proportion of sodium, is the other end member. The composition of gordaita ($\text{SO}_3=50.85$; $\text{Fe}_2\text{O}_3=19.42$; $\text{Na}_2\text{O}=22.36$; $\text{H}_2\text{O}=7.33$) corresponds to $\text{Fe}_2\text{S}_2\text{O}_9 + 3\text{Na}_2\text{SO}_4 + 3\text{H}_2\text{O}$.—*Tamarugite*, from Tarapaca, Chili, is described by Schultze¹¹ as a massive, colorless, radiated mineral, with a hardness of 2, and a density of 2.03. In composition it differs from soda alum in its percentage of water, as indicated by the formula $\text{Na}_2\text{SO}_4 + \text{Al}_2(\text{SO}_4)_3 + 12\text{H}_2\text{O}$.—*Ciplite* is a phosilicate of calcium occurring in the chalk of Ciply, in France.¹²

General.—Up to the temperature of 570° quartz crystals expand rapidly, both parallel and perpendicular to the vertical axis, and at this temperature become fissured. Above this temperature quartz expands very slightly, in some cases even appearing to contract.¹³ Between 560° and 580° sections perpendicular to c become doubly refractive. The double refraction increases rapidly below 570° , and above this

¹⁰ Frenzel. *Min. u. Petrog. Mittheil.*, 1890, XI., p. 217.

¹¹ Verh. d. Ver. Santiago, 1889. Ref. *Neues Jahrb. f. Min.*, etc, 1890, I., 258.

¹² Ortier: Ann. Soc. géol. du Nord., XVI., 1888–89, p. 270. Ref. Bull. Soc. Franc. d. Min., 1890, XIII., p. 160.

¹³ Le Chatelier. Bull. Soc. Franc. d. Min., 1890, p. 112.

temperature remains nearly constant. The birefringence¹⁴ is also subjected to a sudden change at this temperature. Other experiments to be made in this same line will undoubtedly show that 570° is a critical temperature for the mineral, above which it loses its characteristic properties.—Cleavages parallel to R and —R, and less perfect ones parallel to ∞P and oP, have been detected by Mallard¹⁶ in thin plates of quartz. The discovery confirms the suspicion that the mineral possesses obscure cleavages, usually noticeable only when fragments of it are heated and plunged into cold water.—In an article in a recent Bulletin of the U. S. Geological Survey, Mr. Hillebrand¹⁷ gives the results of analyses of some rare zirconium minerals found in the granitic debris of Devil's Head Mountain, Douglas Co., Colo. He also records the analysis of a white *beryl* from the gangue of a cassiterite vein at Winslow, Me. The composition of the beryl is:

SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	BeO	MgO	(KCs) ₂ O	Na ₂ O	Li ₂ O
65.21	tr.	18.50	.33	13.03	.09	.14	.87	.16
H ₂ O Sp. Gr.								
1.80 2.707								

—Although specimens of *tyrolite* recently obtained at the Mammoth Mine, Utah, are sufficiently well crystallized to afford Prof. E. S. Dana¹⁸ data for the determination of the ratio between their lateral axes, it has not been possible to decide upon their chemical composition. The crystals are in flat tables, united into fan-like groups. They are orthorhombic, with their optical axes in the brachypinacoid. Their double refraction is negative and $a:b=.9325:1$. An analysis by Mr. Hillebrand yielded:

CuO	CaO	As ₂ O ₅	H ₂ O	SO ₃	Fe ₂ O ₃	Ins.
45.08	6.78	28.52	17.21	2.23	.08	.16

But this is not capable of representation by a rational formula.—The characteristics of *polycrase* have been defined with some accuracy by Messrs. Hidden and Mackintosh.¹⁹ The material investigated was obtained in the zircon region in Henderson Co., N. C., and from the Upper Saluda River, S. C. The mineral occurs in rough crystals bounded by ∞P₃, P_∞, 2P_∞, P₃, and $\frac{1}{3}P_{\infty}$, the latter new to the

¹⁴ *Ib.*, p. 119.

¹⁵ *Ib.*, p. 123.

¹⁶ *Ib.*, p. 61.

¹⁷ Bull. No. 55, pp. 48-55.

¹⁸ *Amer. Jour. Sci.*, Apr., 1890, p. 271.

¹⁹ *Amer. Jour. Sci.*, Apr., 1890, p. 302.

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species. It is black on a fresh fracture, and has a brownish-yellow translucency on thin edges. It has a density of 4.925-5.038, a hardness of 5.5, and a light yellowish-brown streak. On exposed surfaces it alters to a lemon-yellow *gummite*, with a density 3.354, and hardness 3.5. An analysis of the crystals from South Carolina gave :

Cb_2O_5	Ta_2O_5	TiO_2	Y_2O_3 etc.	PbO	FeO	Fe_2O_3	UO_3	CaO	H_2O
47.88			21.23	.46	2.47	.18	19.47	.68	4.46
		Ins.	SiO_2	F					
		.12	1.01	und.					

The authors call attention to the fact that the mineral is the first representative of the columbo-titanates in America.—The rare mineral *eukairite* has been found in Villa Argentina, Prov. Rioja, Argentine, and at several localities in the Andes, associated with calcite, bornite, and other sulphides of copper. It crystallizes in cubic forms (not necessarily regularly), and has a density of 7.641-7.661, and a composition, according to Otto,²⁰ as follows: $\text{Ag} = 42.7$; $\text{Cu} = 25.5$; $\text{Se} = 31.5$. In general appearance it is like galena.—Lacroix²¹ describes the optical properties of quite a number of *crocidolites*, and concludes that the mineral is a variety of hornblende very widely spread through rocks of various kinds. It may be distinguished from glaucophane by its positive double refraction on basal sections, and its negative refraction in elongated sections.—After analyzing a large suite of *wads* and *psilomelanes*, Gorgeu²² is inclined to regard them as manganites of various bases, corresponding approximately to the formulas $3(\text{MnO}_2)\text{RO} + 1-3\text{H}_2\text{O}$. Among the wads examined were a few quite well crystallized.—Four crystals of *orthoclase* from the porphyritic granite of the Fichtelgebirg are described by Müller²³ as interpenetration twins, in which each individual is elongated in the direction of its *a* axis. Their *oP* faces are in the same plane, so that their combination is \times -shaped, with the twinning plane a hemi-pyramid.—Laspeyres²⁴ suggests that the ground-form of *biotite* be made to correspond with that of *clinochlore*, so that the isomorphism of the two minerals may be made more apparent.—Messrs. Clarke and Schneider²⁵ have shown experimentally that the *talc* from Hunter's Mill, Fairfax Co.,

²⁰ Ber. d. deutsch. chem. Ges., XXIII., 1890, p. 1039.

²¹ Bull. Soc. Fran. d. Min., 1890, p. 15.

²² *Ib.*, p. 21.

²³ *Zeits. f. Kryst.*, XVII., 1890, p. 484.

²⁴ *Zeits. f. Kryst.*, XVII., p. 541.

²⁵ Ber. d. deutsch. chem. Gesel., XXIII., p. 1537.

Va., comports itself more like a meta-silicate than like a basic pyrosilicate. They therefore decide against Groth's formula for this mineral, and propose instead the formula $H_2Mg_3(SiO_3)_4$.—Crystals of *sulphur* containing twenty-one forms line clefts in galena at Bassick. Their axial ratio is $a : b : c = .8151 : 1 : 1.9066$. Busz,²⁶ who describes these sulphur crystals, describes also in the same article a *beryl* crystal from St. Piero, Elba, *fluorspar* and *göthite* from Cornwall, *hypersthene* from Monte Doré, and *corundum* from Lake Laach.—*Bucklandite* from the Pfischthal, Tyrol, and *epidote* crystals from Oberhollersbachthal in Pinzgau, and from Floss in Bavaria, have been examined crystallographically by Brugnatelli.²⁷—*Pyrophyllite* occurring in a granite dyke at Finibo in Sweden, *augite* from Risoe in Sweden, and *martite* from an iron mine in Ypanema, São Paulo Province in Brazil, have been briefly described by Kenngott.²⁸—The composition of *arsenopyrite*,²⁹ from Goldkronach and from Neusorg in the Feichtelgebirge is :

	S	As	Sb	Fe	Ni	Co	Ag	Sp. Gr.
Goldk.	20.84	41.36	3.73	34.07			.002	6.09
Neusorg.	17.27	42.89		34.64	4.38	tr.		5.96

—*Chalcocite*²⁹ from the Kathrina mine near Innsbach, in the Bavarian Pfalz, contains :

Cu	Fe	As	S	Co and Ag	Sp. Gr.
78.44	.93	1.22	20.13	tr.	5.68

—*Minium* from Leadville, thought by Mr. Hawkins³⁰ to be a pseudomorph after galena, has been examined with the following result :

Pb ₃ O ₄	Fe ₂ O ₃	V ₂ O ₅	Insol.	Sp. Gr.	Hardness.
91.39	.80	.52	7.51	4.57	2.5

—Mr. Seamon³¹ thinks that the *calamine* of Missouri was produced by segregation from zinciferous clays formed by the reaction between zinc sulphide and hot silicious waters.—Baumhaur's³² recent investigations on *apatite* crystals from various localities affirm the statement that the density and axial ratio of this mineral increase with the decrease of chlorine in its composition.—In a short communication

²⁶ *Zeits. f. Kryst.*, XVII., p. 549.

²⁷ *Ib.*, XVII., p. 529.

²⁸ *Neues Jahrb. f. Min.*, etc., 1890, I., p. 87.

²⁹ Sandberger. *Ib.*, 1890, p. 99.

³⁰ *Amer. Jour. Sci.*, Jan., 1890, p. 42.

³¹ *Ib.*, 1890, p. 39.

³² *Zeits. f. Kryst.*, XVIII., 1890, p. 31.

Miers³³ shows that *stephanite* is not hemihedral, but that its crystals are usually twinned hemimorphic forms.—Brief descriptions of *cerussite*, *anglesite*, and *calcite* crystals from the Diepenlinchen Mine, near Stolberg, are given by Dannenberg.³⁴—*Phenacite* and *topaz*, the latter altering into *damourite*, occur at Amelia Court House, Va. On the former mineral from Hebron, Me., Mr. Yeates³⁵ has discovered the basal plane.—Prof. Dana³⁶ finds that the barium sulphate from Perkin's Mills, Templeton, Can., described by Lacroix as a monoclinic dimorph of barite under the name *micheel-levyite*, is really orthorhombic, and therefore true *barite*, and that the peculiar striations observed on it are probably due to pressure.—Minute crystals of *jarosite* line cavities in a siliceous *limonite* at the Mammoth Mine, Utah.³⁷—*Thenardite*, *glauberite*, and *calcium carbonate* pseudomorphs of the last-named mineral form thick deposits in a lake-like depression in the Verde Valley, Ariz. Mr. Blake,³⁸ to whom we owe this knowledge, mentions also the existence of *bourbonite* at the Bogg's Mine, Yavapai (?) Co., in the same State.—Hedde³⁹ declares that *brinachite* of Wallace,⁴⁰ occurring in veins in a conglomerate in Inverneshire, is fluorite.—The same author⁴¹ has made a very superficial examination of two crystals of *gyrolite* from the Freshinish Islands, near Mull, England, and pronounces them probably monoclinic.—Solly records his measurements of *struvite* crystals formed by micro-organisms in gelatine culture tubes.

Miscellaneous.—Messrs. Gattermann and Ritschke,⁴² in their work on Azoxyphenolether, have obtained a substance which they call anisolazoxyphenetol. This substance, though liquid, appears to possess many of the characteristics of crystals. Its drops are doubly refractive and dichroic.—In a very interesting communication Rinne⁴³ shows that the oxides of the metals are isomorphous with their corresponding sulphides, a view that is in perfect harmony with the chemical relations existing between oxygen and sulphur. The minerals thus thought to be isomorphous are zincite and wurtzite, valentinite and

³³ *Ib.*, XVIII., p. 68.

³⁴ *Ib.*, XVIII., p. 64.

³⁵ *Amer. Jour. Sci.*, Apr., 1890, p. 325.

³⁶ *Amer. Jour. Sci.*, Jan., 1890, p. 61.

³⁷ *Genth. Ib.*, p. 73.

³⁸ *Ib.*, 1890, p. 43.

³⁹ *Miner. Mag.*, Oct. 1889, p. 272.

⁴⁰ *Ib.*, 1887, p. 42.

⁴¹ *Ib.*, 1889, p. 279.

⁴² *Ber. d. deutsch. chem. Ges.*, 1890, p. 1738.

⁴³ *Zeits. d. deutsch. geol. Ges.*, XLII., 1890, p. 62.

stibnite, manufactured bismuth oxide and bismuthinite. The following groups are also thought to be isomorphous, since they occur in isomorphous compounds: CdO and CdS, MnO and MnS, and FeO and FeS.—Mr. Dudley ⁴⁴ describes pseudomorphs of vivianite after roots of coniferous plants, from the clay banks of the Cumberland River, ten miles above Eddyville, Ky.—In a short note Wulff ⁴⁵ suggests a method by which plane angles may be measured under the microscope when the apex of the angle cannot be seen, and when its two sides cannot be brought into the field of view at once.—Mr. Brünnel, ⁴⁶ of the firm of Voight & Hochgesang, has invented a heating apparatus, attachable to any microscope, for use in mineralogical investigations.

New Books, etc.—The ninth annual report of the State Mineralogist of California contains statistics of the mineral products of the State for the year 1889, and accounts of the geology of the mining districts. ⁴⁷—The Mineral Resources ⁴⁸ of the United States for 1888, though late in appearing, is as welcome an addition to mineralogical literature as any of its predecessors have been. The wealth of information within the 630 pages of the present volume defies abstraction. The value of the metallic products of the country for the year in review exceeded the value of those mined in 1887 by about six millions of dollars; while the non-metallic products were larger by seventy-two millions than those of the preceding year. The totals for 1888 are: Metallic products, \$256,257,517; non-metallic products, \$322,293,159; unspecified, \$6,000,000; grand total, \$584,550,676. Of especial scientific interest is the description of the occurrence and association of the tin ore of the Black Hills, Dak.—The third part of Hintze's Mineralogy, ⁴⁹ which has but recently appeared, concludes the tourmaline group of minerals and takes up the humite, helvine, melanocerite, and other groups of rare silicates, as well as diopside, staurolite, bementite, prehnite, and individual minerals of less common occurrence.

⁴⁴ *Am. Jour. Sci.*, Aug., 1890, p. 120.

⁴⁵ *Zeits. f. Kryst.*, XVIII., p. 277.

⁴⁶ *Neues Jahrb. f. Min.*, etc., 1890, II., p. 87.

⁴⁷ Wm. Ireland. Ninth Ann. Rep. of the State Mineralogist for 1889. Cal. State Miner. Bureau, Sacramento, Cal.

⁴⁸ D. T. Day. Mineral Resources of the United States for 1888. Washington Govt. Print. Office, 1890.

⁴⁹ Leipzig. Veit & Co., 1890, pp. 321-480, 79 Fig.